Magnetic structure of nanometer scale magnetic antidot arrays

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Magnetic antidot arrays are groups of ordered holes patterned on a continuous magnetic film. They can be used as magnonic crystals with potential application in microwave devices [1], for magnetically-active plasmonics [2], and for biosensing applications [3]. We have followed two different routes to obtain magnetic antidots on Co, Permalloy (Py), and Co/Py films with different characteristics. Focused ion beam allowed obtaining hexagonal or square lattice antidot arrays with long-range order (hole diameter d=55nm, periodicity p=150-300nm) [4], whereas oblique deposition onto nanoporous alumina templates was used to obtain arrays with only hexagonal short-range order (d=40nm, p=105nm) [5]. The arrays were studied by magneto-optic Kerr effect, magnetic force microscopy (MFM) and micromagnetic simulations. It is shown how the coercivity increases with the density of antidots and the magnetic anisotropy axes strongly depend on the array symmetry. The MFM images show the magnetic structure of the arrays to be commensurate to their morphology, with domain walls (DW) pinned by the holes and in some cases super-DW separating linear domains (see Fig.).

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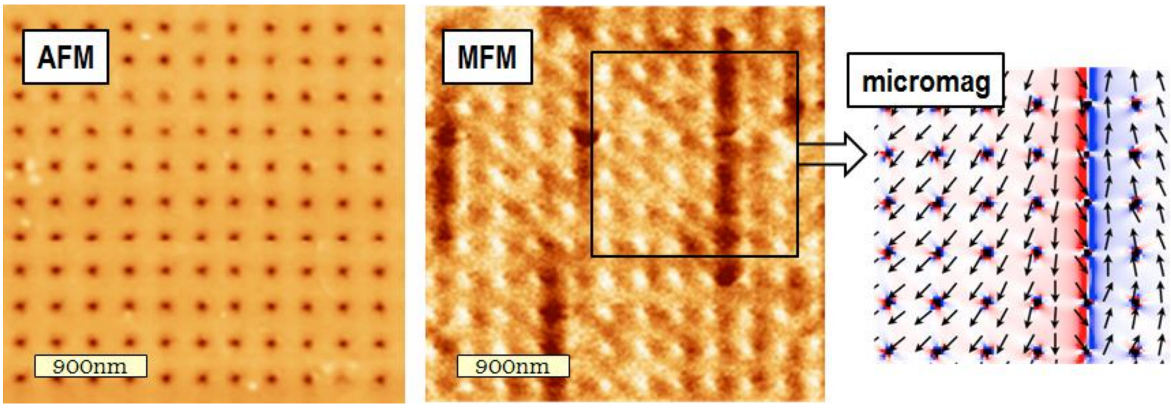

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